Feasibility of
Coded Wire Tagging Wild
Spring Chinook
On The Chehalis River

U.S. Fish and Wildlife Service
Fisheries Assistance Office, Olympia

by

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INTRODUCTION

The Chehalis River spring chinook run has received much Olympia Fisheries Assistance Office (FAO) restoration effort since 1980 (Hiss et al 1983, 1984) because it appeared to have chronic underescapement. These efforts have so far aided in protecting these fish in freshwater by refining the escapement estimates and describing the adult holding distribution and summer water quality. However, we still need information on their distribution in salt water. Knowing how various chinook stocks contribute to the many marine fisheries could greatly help to direct the offshore conservation efforts (U.S. Canada Chinook Technical Committee 1983). This information is best obtained by coded wire tagging. Olympia FAO studies the feasibility of capturing wild spring chinook fingerlings on the Chehalis River for coded-wire tagging.

This method requires releasing a large number of tagged juveniles to get meaningful results from the adult recoveries. The Chehalis also supports a fall chinook run, which returns to Grays Harbor much later than the spring run and is managed separately. Any attempt to tag spring chinook must separate the spring and fall runs as juveniles. Getting enough spring run juveniles depends on being able to separate them from the fall race by capture time, capture location, or length frequency distribution. Therefore, we also analyzed the existing WDF beach seine data to see if this separation could be done.

Three types of common gear can collect juveniles salmonids: electroshocking, beach seining, and trapping. Since there was no existing electroshocking data, we investigated the electroshocking success rate in early 1984 to determine if an adequate sample size could be captured by shocking. In addition, we reviewed Washington Department of Fisheries (WDF) unpublished data on 1973 - 1984 beach seine catches, and WDF 1976 and 1977 trapping studies (Brix and Seiler 1977, 1978).

Wunderlich (1982) estimated that a minimum of 10,000 wild Nooksack spring chinook would have to be tagged to derive a percent contribution to Marine versus Puget Sound fisheries with acceptable confidence limits. He believes a release of 60,000 would have been much more effective in achieving the goals of the project (personal communication). Since the goal of the proposed Chehalis tagging is likewise to determine the contribution pattern, it appears that a goal of a least 10,000 tagged juveniles is reasonable.

METHODS

Electroshocking

We began electrofishing in January 1984, when spring chinook fry were to emerge from the gravel. Operations continued until late March, when it was clear that catches would not increase. We chose three areas where we anticipated catching spring run but not fall run fry. These were the Skookumchuck river mile (RM) 21.1 to 21.8, the South Fork Newaukum RM 19.4, 16.3, and 13.6, and the upper mainstem RM 108.7 and 111.0 (Figure 1). We chose the Skookumchuck site because mostly spring run fish appear to spawn there. Some fall run may spawn there too, but most concentrate further downstream. We chose the Newaukum and upper mainstem sites because only the spring run appears to spawn there. We also shocked the lower mainstem RM 52.0 to 64.0, hoping to separate spring and fall run fish by length frequency analysis.

We used a battery-powered backpack electroshocker, adjusted to avoid mortality by keeping the output near 0.5 amps of pulsating direct current. We shocked in habitat types we thought would yield the most fish, making several passes through the same reach. We counted and measured the chinook and returned all fish to the river.

To estimate how many fish an intense collecting effort would produce, we calculated the mean daily catch in each area for the season, and assumed the area could yield as many fish every other day for 2½ months. The assumption of repopulation every other day is based on the Nooksack study, where electroshocking at this rate produced consistent returns.

Beach Seining

The WDF beach seines near Oakville every year. They try to begin in March when flows have dropped enough to permit seining, and continue every two weeks until June when most salmon smolts have left the area. The WDF chose the reach from Independence to Oakville because this area had more gravel bars available for seining than anywhere else on the river. They fished with a standard procedure each year to register the relative abundance of outmigrants over the years. They counted all chinook and measured a random sample of about 20 per seine haul.

We analyzed the data to see if seining could provide enough fish for tagging. First we separated each day's catch into spring and fall run components based on length frequency. We did this by assuming that the size of both groups were normally distributed about their respective mean lengths, but that the spring run was made up of generally larger fish having a lower, flatter curve than the fall run. On this basis we tried to find a cutoff between the two groups. We verified our choice by comparing it to other dates and other years for the same date. We calculated the percent spring run in the sample from the number of fish larger than the cutoff point. We applied this percentage to the day's chinook catch to estimate the spring chinook catch. (See the Appendix for details.)

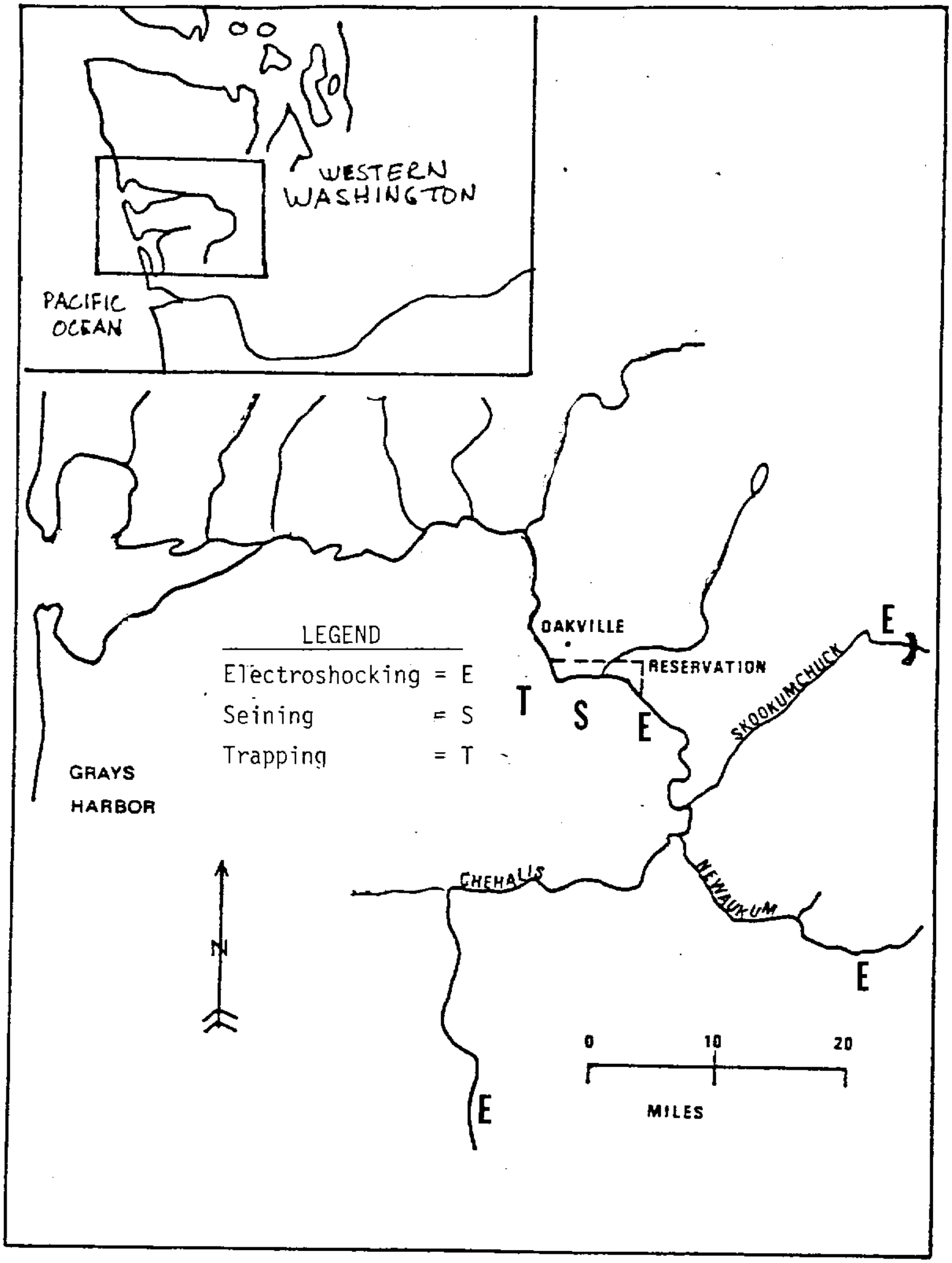


FIGURE 1. Chehalis River System, showing fish collection areas.

We then expanded the estimated spring run portion of the catch to represent the two-week period before the next seining day. We did this by multiplying by 7, assuming, as with the electrofishing data, that fish would repopulate the area quickly enough to provide about the same catch every other day.

Trapping

The WDF operated a floating scoop trap near Oakville in the spring of 1976 and 1977. They began in mid-April and continued to late May, to monitor the coho smolt migration. The trap fished nearly every day for 24 hours. All chinook were counted but apparently none were measured.

We analyzed this data to see if trapping might provide enough fish for tagging. We totalled the trap catch for two week period corresponding to the beach seining. Then we applied the percent spring run from the beach seine calculations to estimate the total spring run that the trap caught.

RESULTS

Electroshocking in the upper watershed produced a projected total catch of only 1,184 spring chinook (Table 1). Shocking catch in the lower mainstem was not separable into spring and fall runs. Either the catch was to small for length frequency analysis, as on February 2, March 9, and March 14, or else the distribution had only one mode as on March 8. Fish caught on this date were probably fall run, based on comparison to length frequency analysis of beach seine catches. In these catches, a single peak usually is present in March and two peaks are usually present in April and early May. Assuming a moderate rate of growth, the March peak appears to correspond to the smaller sized group of fall chinook in the April-May peak. The alternative hypothesis, that the March peak represented spring chinook is unreasonable since it would require an unusually rapid growth rate for this group between March and April. The interpretation that the March beach sine catch as fall chinook agrees with the probable spawning distribution of the two runs. Fall chinook are generally thought to spawn in the mainstem Chehalis throughout the WDF seining area, but spring chinook appear to concentrate their spawning in several areas further upstream. Consequently, it is reasonable that fall chinook would be present in the seining area in March whereas spring chinook would arrive later in the season from points upstream. For these reasons the March electroshocking catch also probably represents the fall run.

Beach seining produced a projected mean catch of 4,273 spring chinook (Table 2). Only one year, 1979, produced a projected catch over 10,000, and all other years were well below that number.

Trapping produced a projected total catch of 973 spring chinook, averaged between 1976 and 1977 (Table 3).

Table 1. Electroshocker Catch, 1984.

Location	Date	Catch: Actual	Catch: Mean	Catch: Projected a/
Skookumchuck	1-16	1		
	3-7	7	4	128
Newaukum	2-9	15		
	2-24	22		
	3-27	21	19	608
Upper Mainstem	3-2	25		
	3-27	3	14	448
Total				1,184
Lower Mainstem	2-2	6 b/		
	3-8	157 b/		
	3-9	9		
	3-14	50	56	b/

a/ Based on 32 days of collecting between 1-15 and 3-31.

b/ No catch projected because length frequency distribution had only one mode; thus, spring and fall run could not be distinguished.

Table 2. Projected beach seine catches of spring chinook

Year	Period when separation of runs is possible	Projected total catch
73	4/16 to 5/28	7,238
74	4/29 to 5/13	2,065
75	4/15 to 6/10	4,396
76	4/12 to 6/8	3,619
77	4/11 to 5/23	3,843
78	3/28 to 5/23	4,599
79	4/3 to 5/29	17,493
80	4/1 to 4/30	980
81	3/18 to 5/13	3,829
82	a/	0
83	b/	0
84	4/2 to 5/21	3,209
Mean		4,273

a/ Bad river conditions prevented seining.

b/ Length distribution did not permit separation of runs.

Table 3. Estimated trap catches of spring chinook.

Year	Period when separation of runs is possible	Estimated catch
76	4/15 to 5/26	275
77	4/11 to 5/23	1,671
Mean		973

DISCUSSION

None of the methods we examined could reliably capture enough spring chinook for tagging in most years. Even all three methods combined would not provide adequate numbers of fish for tagging. Even if trapping would increase the catch over seining alone by 43%, as it did in 1977, and that shocking would increase the catch over seining alone by 37%, as it did in 1984, then to catch 10,000 fish we would need to catch "S" spring chinook by seine, where

$$10{,}000 = S + 0.43S + 0.37S$$

$$\text{or} \quad S = 5{,}555$$

The projected seine catch of spring chinook only surpassed this twice in the past fourteen years.

There were two other methods we were not able to test in 1984; fyke trapping and temporary weirs. Both require more attention to planning, construction, and daily operation then we could devote this year. Neither of these methods shows great promise, however, because the typical stream flows below the major spawning grounds are normally too high for this kind of gear.

The projected seine catches of spring chinook have suggested a new line of research: examining the effect of escapement and winter flows on the annual seine catch of spring chinook. It was striking, for instance, that the high outmigration of 1979 corresponded to the high escapement of 1978. Such a study would help in understanding factors which limit the run size and directing future evaluation efforts. In cooperation with WDF, we propose analysis the existing chinook migration data.

LITERATURE

Brix, R. and D. Seiler, 1977. Upper Chehalis River smolt trapping study, 1976. State of Washington Department of Fisheries, Progress Report 25:1-14.

Brix, R. and D. Seiler, 1978. Upper Chehalis River smolt trapping study, 1977. State of Washington, Department of Fisheries, Progress Report 48:1-16.

Hiss, J.M., J. Meyer, and R.S. Boomer. 1984. Chehalis spring chinook progress report, 1983. Fisheries Assistance Office, U.S. Fish and Wildlife Service, Olympia, Washington. 34p.

Hiss, J.M., J. Meyer, and R.S. Boomer. 1983. Chehalis spring chinook progress report, 1980-82. Fisheries Assistance Office, U.S. Fish and Wildlife Service, Olympia, Washington. 54p.

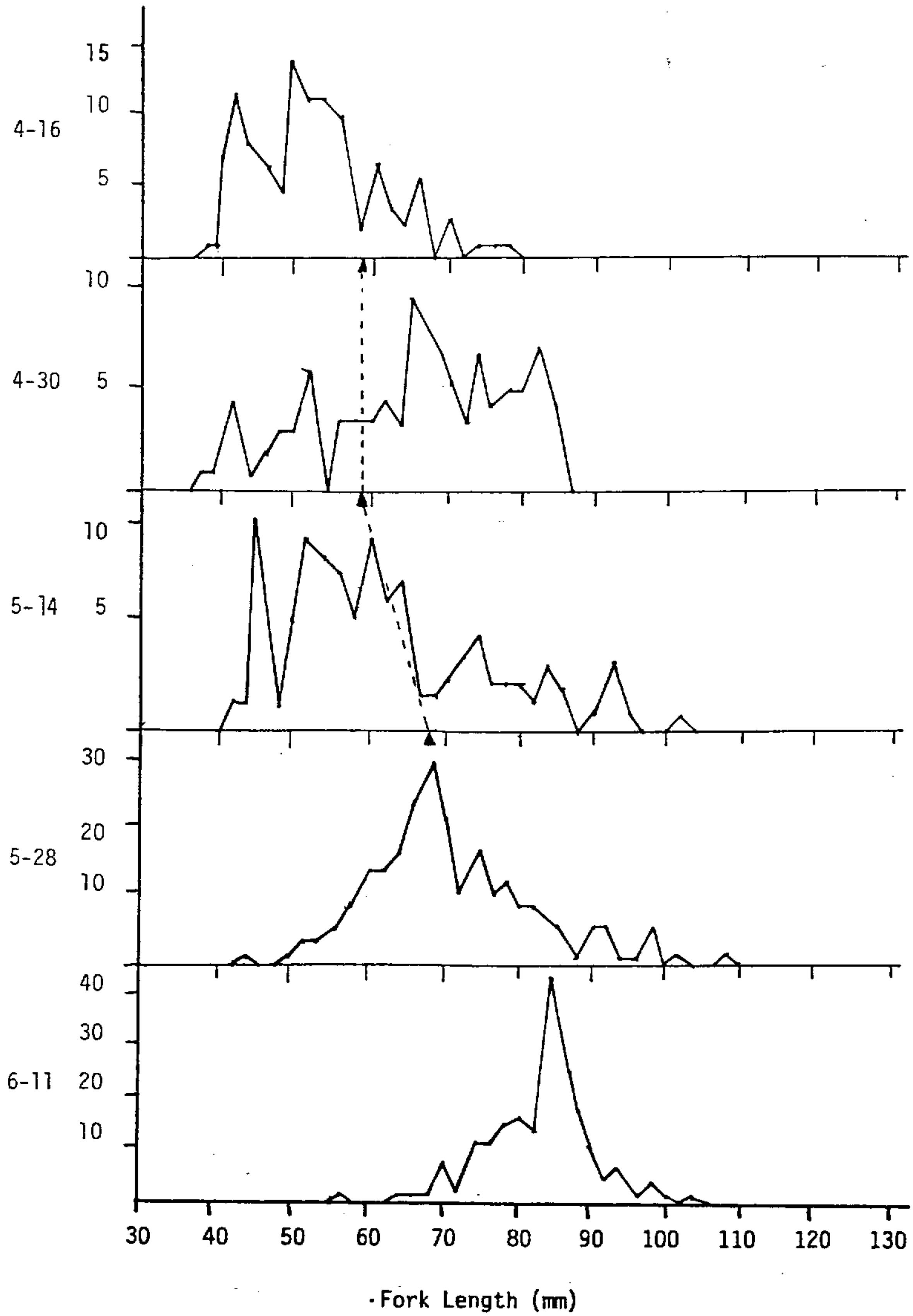
United States - Canada Chinook Technical Workgroup. 1983. Report of the U.S./Canada Technical Committee Seattle, Wash. 19p.

Wunderlich, R. 1983. Nooksack River juvenile spring chinook salmon investigations - 1982. Fisheries Assistance Office, U.S. Fish and Wildlife Service, Olympia, Washington. 17p.

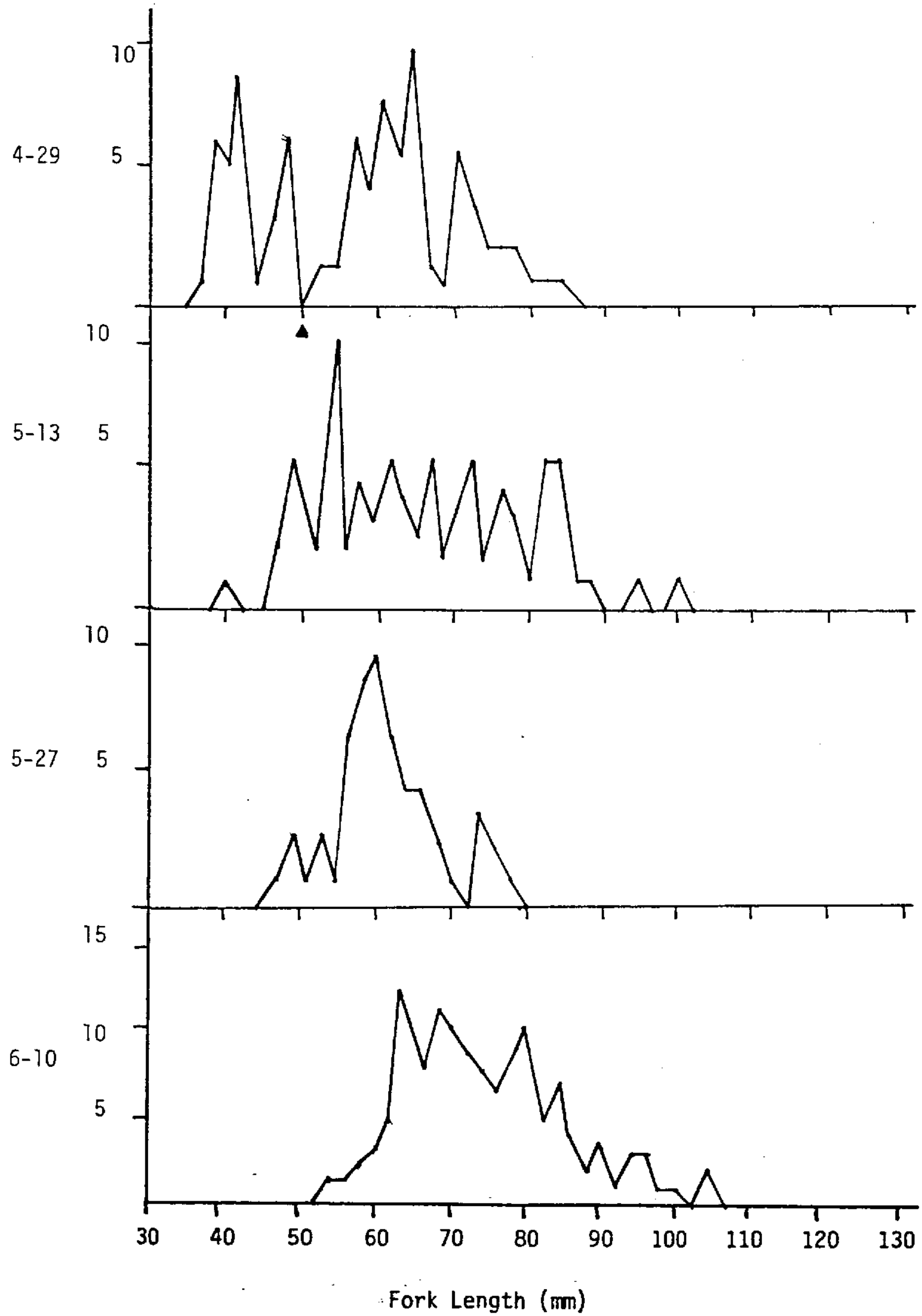
APPENDIX

ANALYSIS OF BEACH SEINING DATA

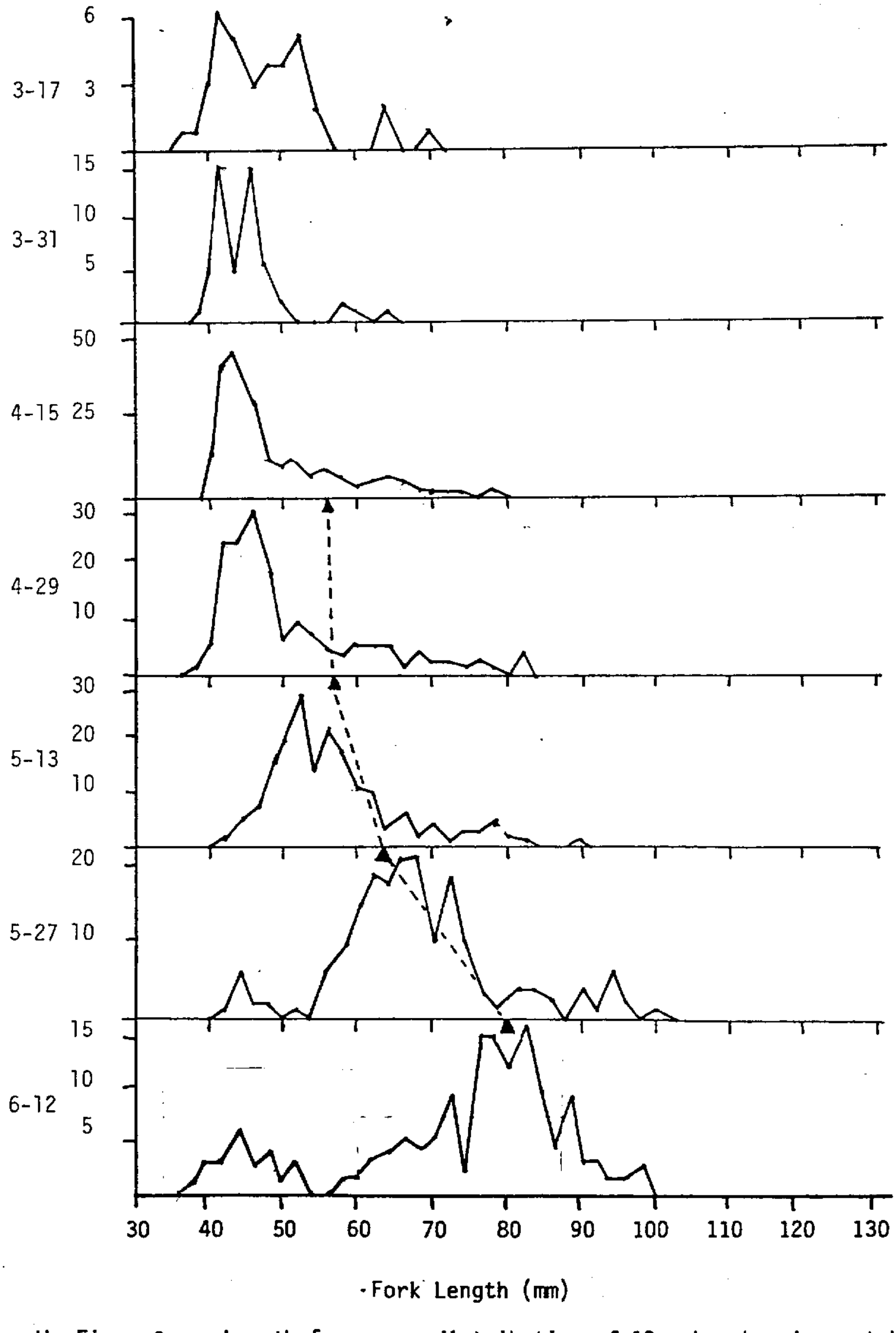
Spring and fall run outmigrants were separated by length frequency distribution (Appendix Figures 1 - 11). An arrow marks the cutoff between the two, when two groups were apparent. The group with the greater average length presumably represents spring chinook.



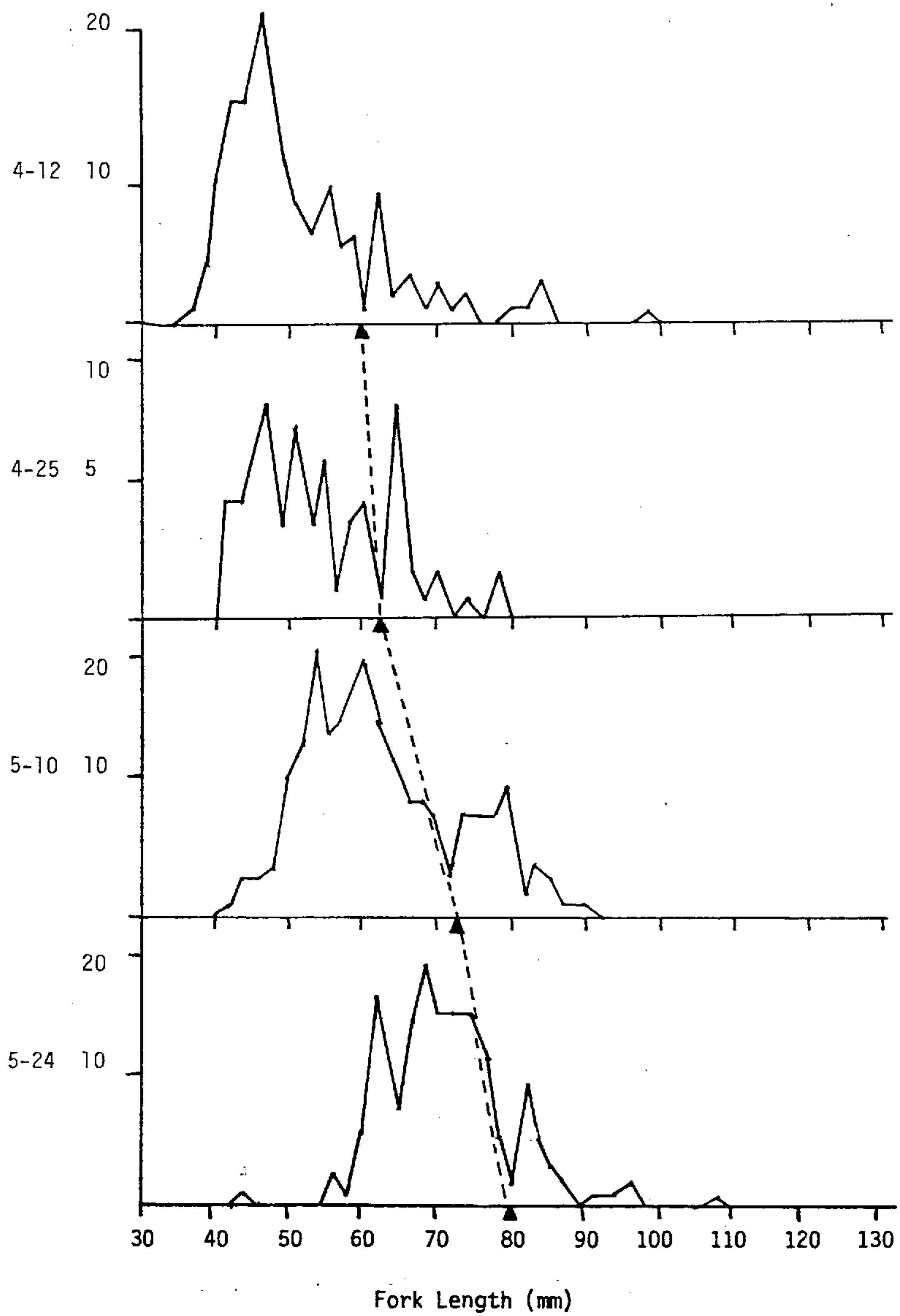
Appendix Figure 1 . Length frequency distribution of 1973 beach seine catch.



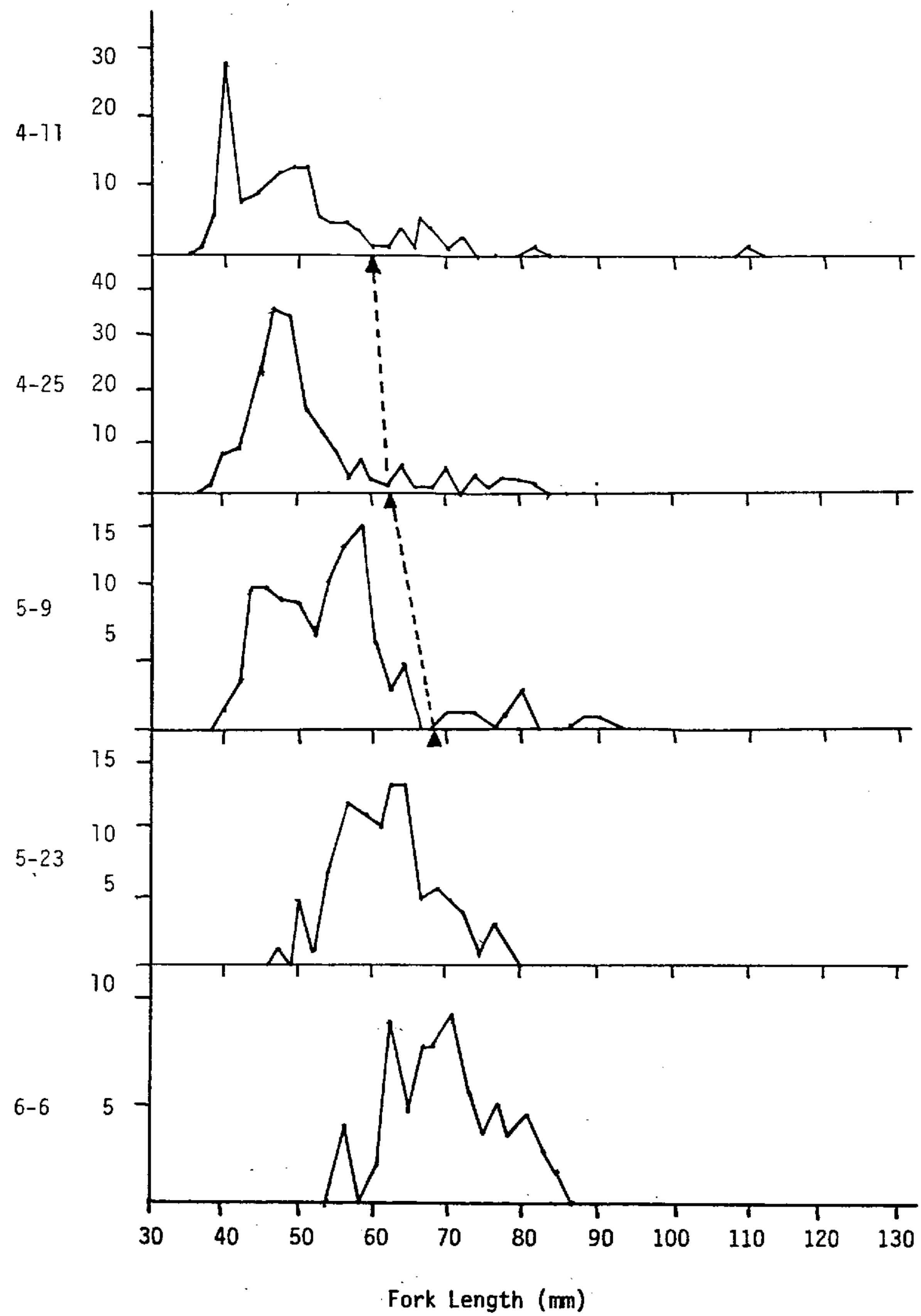
Appendix Figure 2 . Length frequency distribution of 1974 beach seine catch.



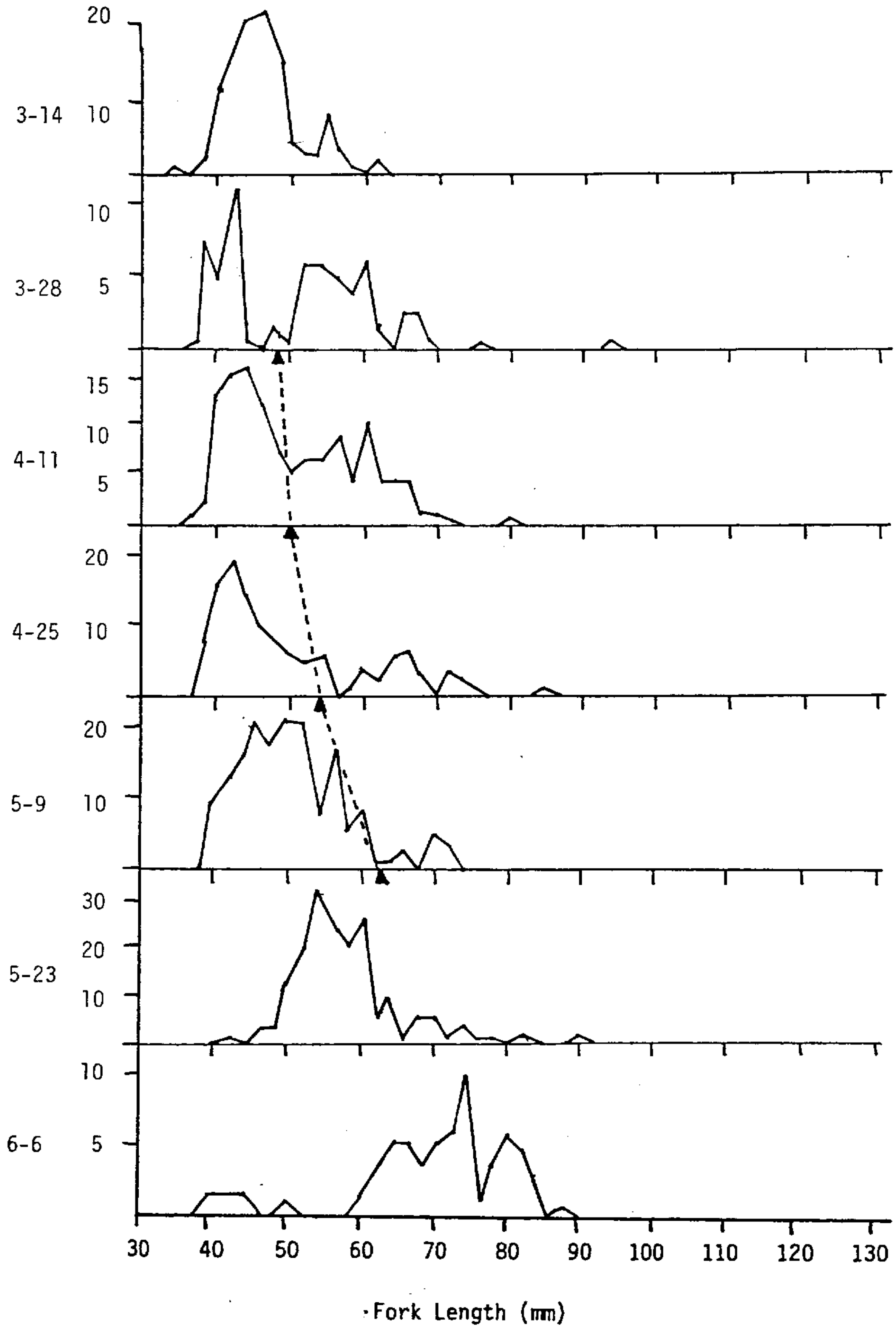
Appendix Figure 3 . Length frequency distribution of 1975 beach seine catch.



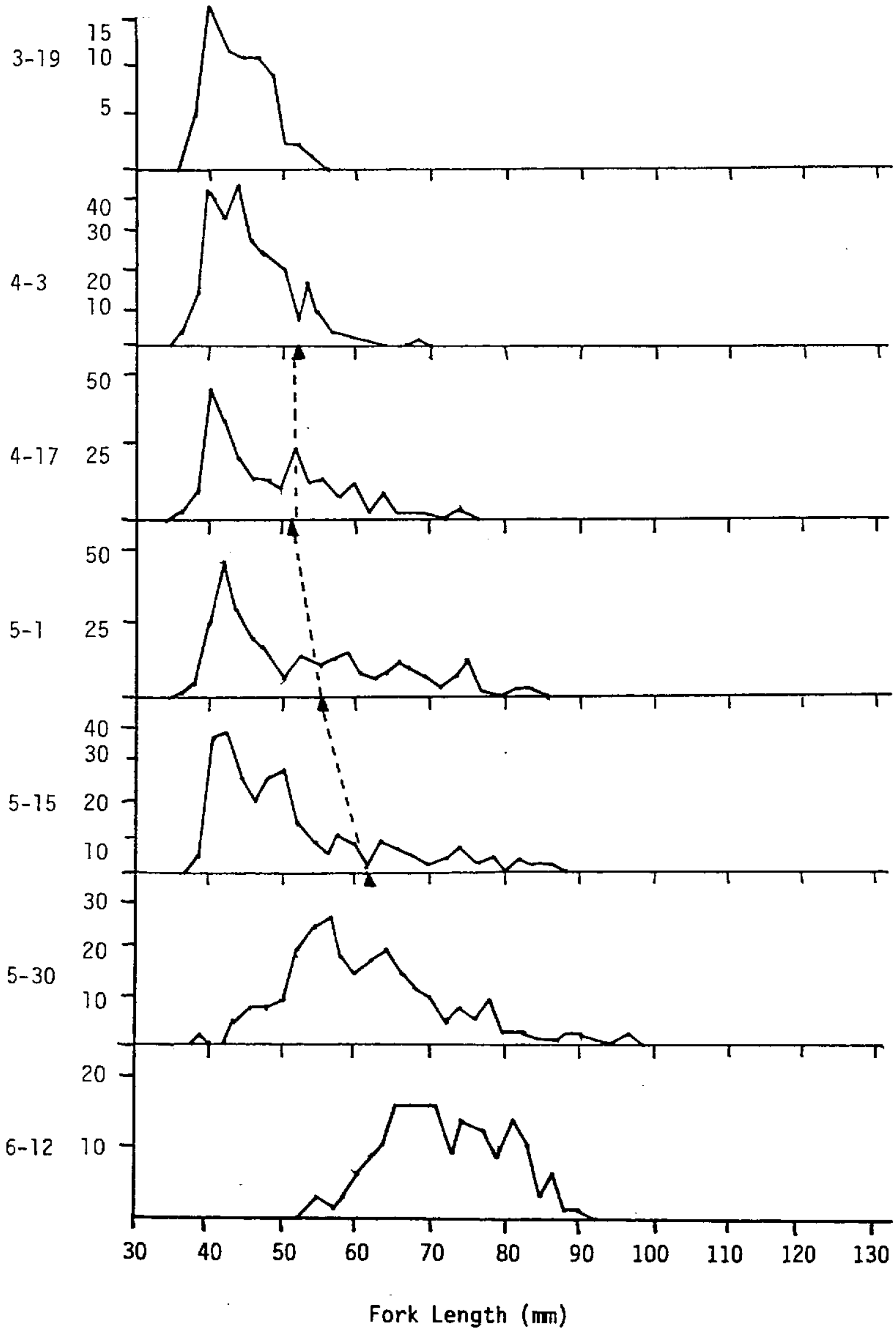
Appendix Figure 4 . Length frequency distribution of 1976 beach seine catch.



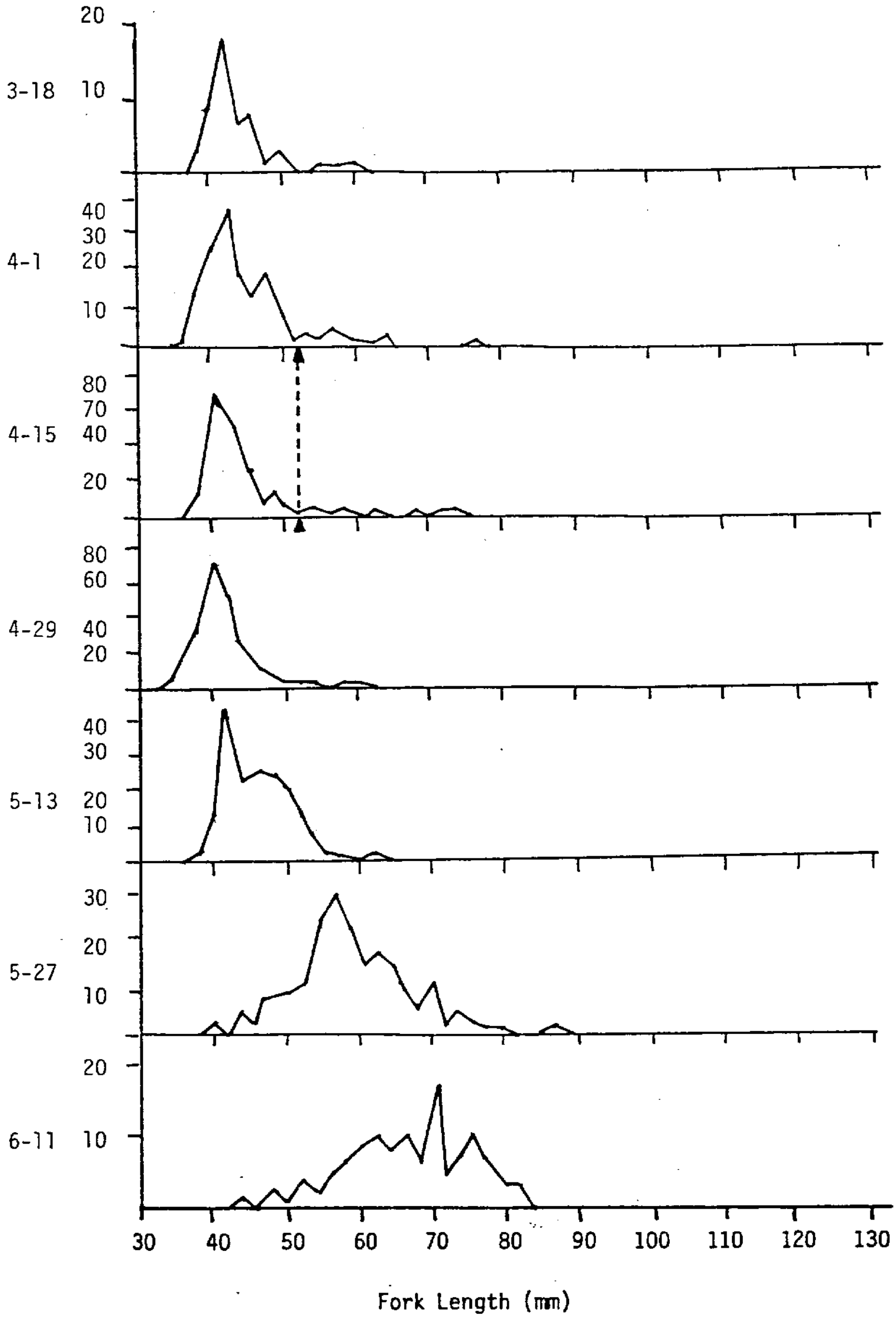
Appendix Figure 5 . Length frequency distribution of 1977 beach seine catch.



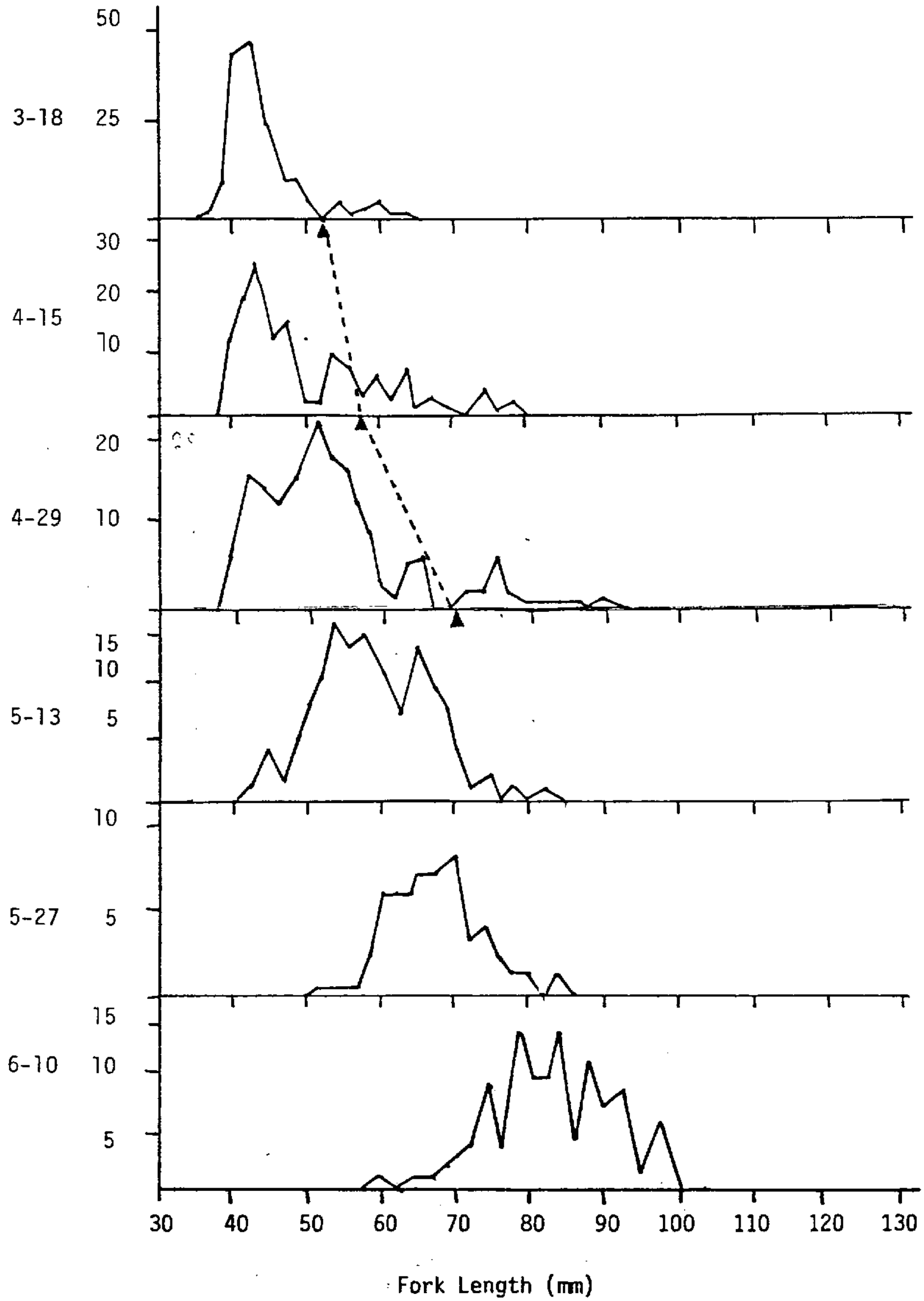
Appendix Figure 6 . Length frequency distribution of 19 78beach seine catch.



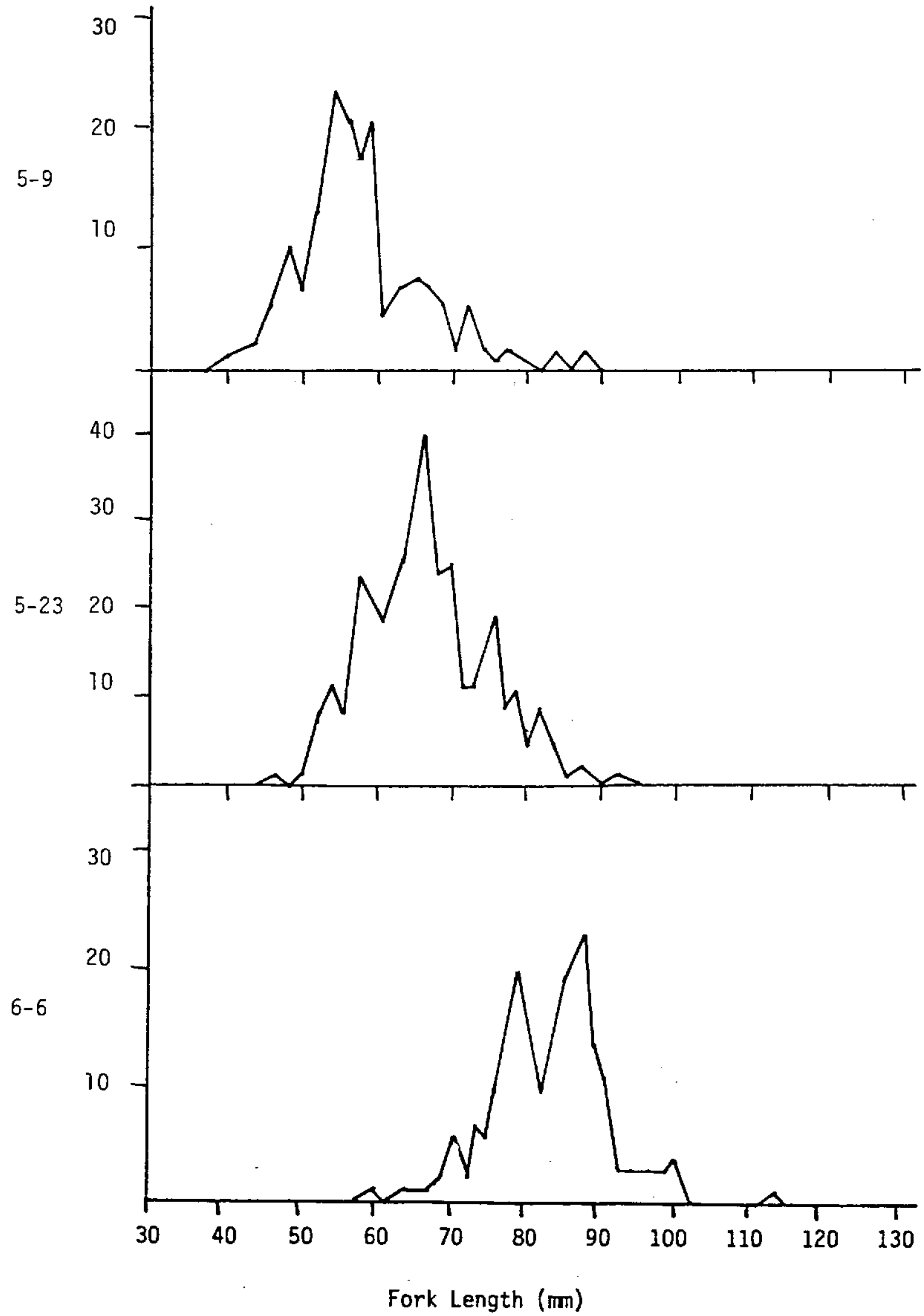
Appendix Figure 7. Length frequency distribution of 1979 beach seine catch.



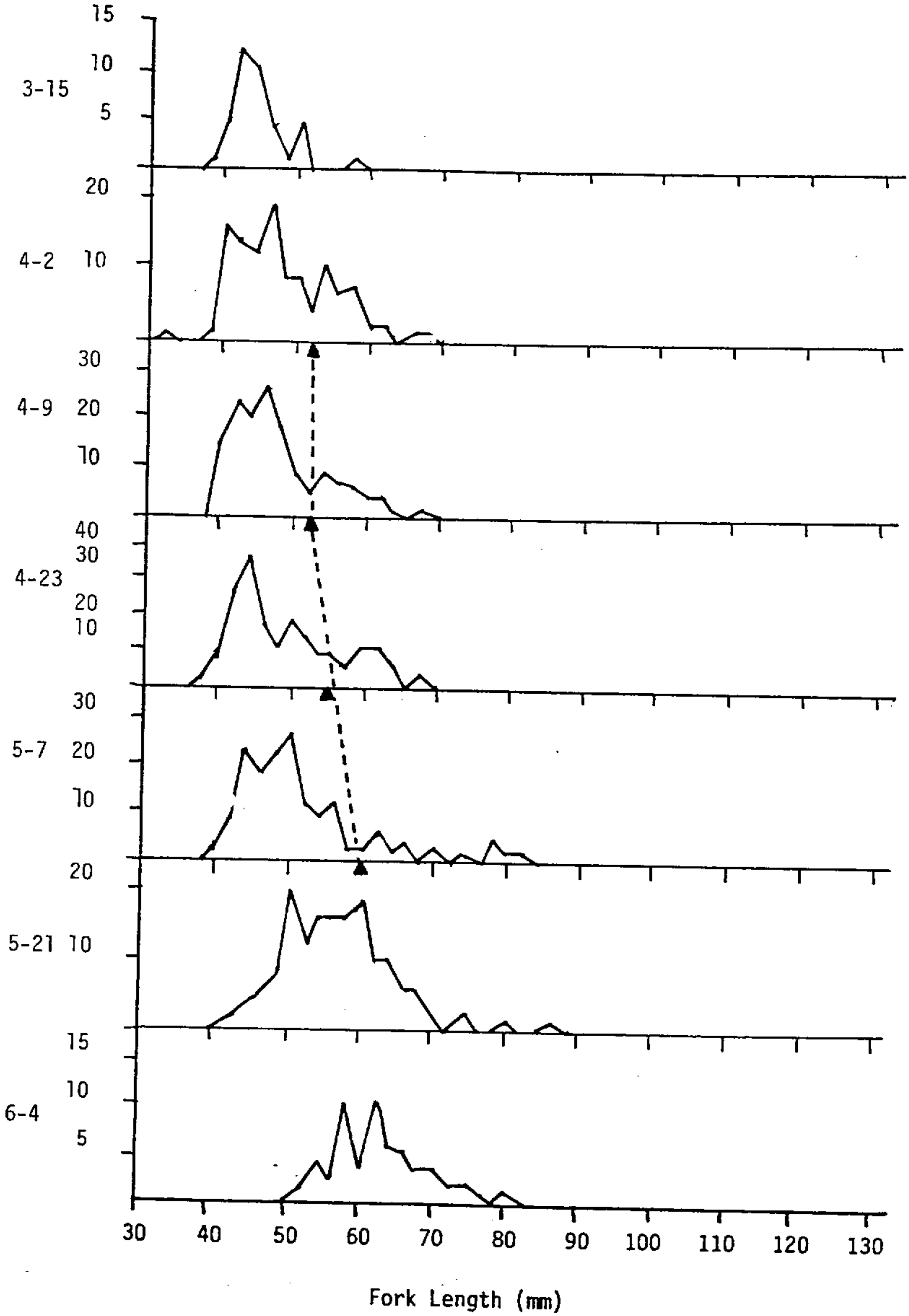
Appendix Figure 8 . Length frequency distribution of 19 80beach seine catch.



Appendix Figure 9 . Length frequency distribution of 1981 beach seine catch.



Appendix Figure10 . Length frequency distribution of 19 83beach seine catch.



Appendix Figure 11. Length frequency distribution of 1984 beach seine catch.